Menlo Park Notebook #63 [N-80-02-08.1]

This notebook covers the period January-June 1880. Most of the entries are by Francis Upton. Included are calculations relating to tests of carbon filament lamps and a few drawings of circuits used for the tests. Other material includes Edison's earliest drawings and notes on the "Edison Effect" and drawings, probably by Charles P. Mott, of vacuum pumps and lamps. The label on the front cover is marked "Carbon Lamps" and "Upton Resistances." The book contains 171 numbered pages followed by 2 unnumbered pages. The pagination is irregular. Sometimes only the right-hand pages are numbered, and some numbers are used for more than one page.

Blank pages not filmed: 171

Missing page numbers: 1-2, 65.

Size Carbon Manilla page 3
Bast 0".009 X 0".012 page 13
Bridge page 131

No. 63

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120 BROADWAY, NEW YORK.

GENERAL ELECTRIC.

...., 189

N-80-02-08

---

117 Ohms

D = 235 Lamp 609

D = 105

```
     235
     117
    ----
    1645
    235
   235
    -----
105)27495(262
    210
    ---
     649
     630
     ---
     195
```

Carbon of manilla fibre
480 Ohms cold
262 Ohms hot
$\frac{250}{3}$ volts = 83.3 Volts

N-80-02-08

Size Carbon Manilla page
Bast 0".009 X 0".012 page 13
Bridge page 131

No. 63

Thomas A Edison

Columbia Lamps pp. 101 — 113

N-80-02-08

117 Ohms

D = 235 Lamp 609

d = 105

100 Ohms cold
262 Ohms hot

$\frac{250}{3}$ volts = 83.3 Volts

N-80-02-08

83

83

249

664

6889

440

20667

27558

27332

262)30494 217 (1164

262

429

262

1674

1572

1024

28 per H.P.

1164)33,000 (~~28~~ 28

2328

9720

9148

1572

75 = D

75!

Lamps

115 90 Volts

260

115 : 260 :: 117 : 266

```
      117
     1820
     260
     260
115)30420 (266 Ohms
    230
     742
     676
      720
```

---

again 53 Volts

D = 102

Bicromate cell = 2 Volts
Ohms on resistance box
Divide No. Volts by No. Ohms
result Webers!

12600) 6.0000 (48
50400
9600

.00048 Webers

.51 mg per hour

.00051 gr. per hour

2100
.00051
2100
105
1.071 00 Gr per Weber per hour

.377 Millgr

60
17) 22.62.0 (2.0. Millgr per minute
2
5

97
12
194
97
1164

20
60
1.200 Gr. per Weber

90

220

90) 220 (2.44
180
400
360
4

117
2.44
468
468
234
285.48

285 Ohms

125 = ω

45 Valts

40 =

40 : 125 :: 117 : X

117

875

125

125

40)14625(365.6

160

240

225

200

25

50 Valts

50 : 140 :: 117 : x

117

980

140

140

50)16380

327.6

1160

7020

117

60)18720(312

174

132

116

16

55 Valts

60 : 160 :: 107 : x

60

58)9600(165.5

58

380

348

320

290

300

60 Volts

60 : 68 ::

68 : 178 :: 117 :

178

936

819

117

68) 20826 (306.4

204

426

408

80

---

65 Volts

75 : 187 :: 117 : x

137

819

351

75) 16029 (213

150

102

75

279

225

540

525

117

187

819

936

117

75) 21879 (291.7

150

687

675

129

75

540

70 Volts.

80 : 197 :: 117
117
1379
197
197
80) 23049
288.1

---

75 Volts

92 : 213 :: 117
213
351
117
234
92) 24921 (271.
184
652
644
81

80 Volts.

```
98 : 230 :: 117 : x
       117
      1610
      230
     230
98) 26910 (274.
    196
     731
     686
      450
      392
       580
```

---

85 Volts.

~~75 Volts.~~

Resistance 181

175 : 278 :: 181
278
1448
1267
362
175) 50318 (287
350
1531
1400
1318
1235

45 Volts

~~168 : 92 :: 181~~

92 : 168 :: 181
168
1448
1086
181
92) 30408 (331
276
280
276
48

2nd C

50 Volts

102 : 1.81 :: 181
181
181
1448
181
102) 32761 (321
306xx
216
204
121

---

55 Volts

116 : 202 :: 181
202
362
362
116) 36562 (315
348xx
176
116
602
580

60 Volts.

90 : 168 ::

130 : 225 :: 181

```
           181
           225
          ----
           905
          362
         362
        -----
130) 40725 (313
     390xx
     ---
      172
      130
      ---
       425
       390
       ---
        35
```

6
6
36
14
54
6 Ohms

1807) 33000 (18 per H.P.
1807
14930

6 5 Volts

148 / 245 // 181
245
305
724
362

148) 44345 (306
444 x x
945
888
570

7

111
111
111
111
111
112321
44
49284
49284

250) 542124 (21
500
421
250
1710

3~~00~~) 54212~~4~~
1807

$$D = \frac{85}{204 \times 262}$$

$$x = \frac{113}{162\,D} - 6$$

$$= \frac{113}{\frac{162 \times 85}{204 \times 262}} = \frac{113 \times 204 \times 262}{162 \times 85} - 6$$

162) .416 (.00256
324
920
810
1100

.00256
.262
512
1536
512
.67072

.670) 113.0 (1

162 = D

28 Volts added
85 + 28 = 113 Volts

262 ~~R~~= 204 Ohms

9
5
3.5
1.8
5.3

6 Ohms

324

$$262\,D = \frac{85}{204}$$

$$162\,D = \frac{113}{6 + x}$$

204) 850 (.416
816
340
204
1360

D = .416
162
832
2496
416
67392

$$D = \frac{.416}{162} = .00256$$

$$x = \frac{113}{262\,D} - 6$$

1490)33000(22
2980
3260

113
204
452
226
23052
262
462
1386
462
6052200

162
85
810
496
5770

5770)6052200(1

115
115
575
115
115
13225
44
52900
52900
581968

~~3~~ 89) 581900 (1480
389
1920
1556
3640
3112

570 (23
4
.42) 170

320 : 135 :: 204
204
540
270
320) 27540 (86
2560
1740
1920
20

165 : 310 ::
204
1240
620
1.65) 63240. (2383. Ohms hot
495
1370
1320
500

Jan

2.9 inches .2121
.5
2.4 length

40
.005
3

2.4 inches length
.005 in diam

3.14
.005
.01570
2.4
628
314
.03768

.037) .2121 (5.7
185
270
259
110

86)383(4
344

266
88 Volts

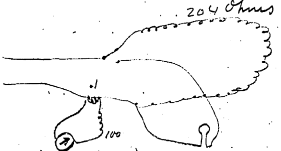
86)343060(3988
258
850
774
766
688
780

3.3

21)33
24
80
72

Regular lamps
marked 145 ohms cold
gave with 88 Volts
86 Ohms resistance

Method


204 Ohms
.1
100
Thomson low resistance

Fine light

16

22 √

$h = l\sqrt{S}$

$= c\sqrt{S}$

$16 : 22 :: \sqrt{2.4} : \sqrt{x}$

16 22

96 44

16 44

256 : 484 :: 2.4 :

2.4

1866

968

256) 11546 (45

1024

1306

1036

a filament .005 inch in diam 2.4 inches long gives 22 per H.P. how long to give 16 per H.P.

ans 4.5 inches

2.5 : ~~4.5~~ :: 389

5 9 9

3501

700

16) 33000 (2062

32

100

96

40

200

14 43400

443) 1443400 (3258

1329

1144

886

2580

2115

3650

3 28 50 (181
1
28) 228
224
36) 450

181
1

J. T

Gas jet 26.5
26.5
1325
590
530
702.25

Elec light

22
22
44
44
484) 702
484
2180

1.4) 16 (11
14
20

11 candles

20
20
400

28
28
224
56
784

---

1 07 A. M begins

Meter 1 exactly

1 18

11 minutes

1.20½
7
13½

13.5 : 60 :: .5
.5
13.5) 30 (2.2
27
30

Meter measurement of ordinary gas jet

1.07 d.A	1 foot mark
1.20½ A.M	1½ foot
1.38	2 feet

again 2 15 A.M
3 15 A 2 feet

376) 2,2100 (5~~8~~72
1850
271.0
~~21448~~
2632
0780
58
49
) 1900
572 (23
4
43) 172
129
43.00

~~7~~80

Feb. 8

A filament of carbon estimated as .005 inches in diameter 2.4 inches long had a resistance cold of 505 Ohms hot " 383 Ohms

Surface .03768 inches

The "regular" horse shoe has a surface of .2121 inches

$2121 : 376 :: X^2 : 10^2$

If the number per horse power varies inversely as the ~~sq~~ square root of the surface the fibre should give 24 where the regular gives 10

22 small gas jets obtained per horse power

5 inches

1/8

9
72

1/16   5 inches to travel

9 - 2½   6½

1¼

7¾ inches

7.75
3.14
3100
775
2325
2 24.3350

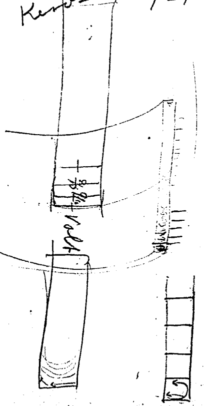
16) 12.0 (.75 inch
112
80

38
38
304
114
1444

Gas

67
38
27
27
189
54
729

Kerosene



.175

5 inches

---

90 Volts

75 coils

90 ~~150~~ coils

150 turns

$\frac{90}{150} = \frac{3}{5} \times \frac{1}{72} = \frac{3}{360}$

$= \frac{1}{120}$ Volt

Outside 109.5 (.5

Inside $\frac{2.5}{9} = .277$

12000) 277.000 (.000 23

.023

.0026 9 023

.0026.) .02343.5 (9

234

~~9~~ ft lbs

$72 \times 9 = 648$

.00026

.026

4

1.20) 277

$\frac{1}{1000}$ $\frac{1}{4000}$

$\frac{1}{1000}$

.023 Volts

1/120) 1.00 .00933

40

.00933

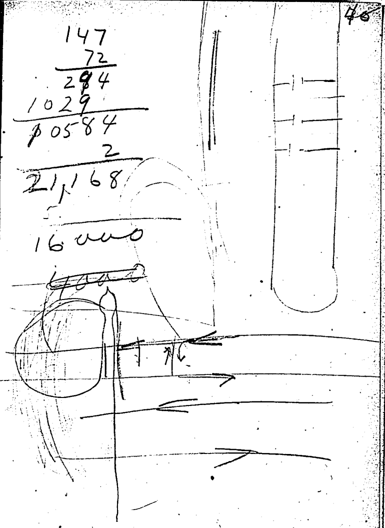
.0038315

.000026) .003831 (147
26
123
104
191

147
72
294
1029
10584
2
21,168

16000

~~4000~~



1 R = 1

1000 × 1000

1~~000000~~ × ·000340.

4) 340 lbs.

85

255 lbs.

205 65

143·793 c. mm

143 cc.

1 cc = ·061 cu. inches

1 mm = ·0061 cu. inches

·0061) 1·0000 (1~~6~~3
163

1000000

16·3

1 cc^3 = ·061 cu inches

1 cm^3 = ·000061 cu inches

·000

1 mm^3 = ·000000061

·000000061) 1.000000 (16300

1.000,000000

1638~~60~~

Manilla Fibre

Resistance 262 Ohms

D = 225

D = 360

360 : 225 :: 262

```
      262
      450
     1350
     450
360 |58950 | 163 Ohms
     360
     2295
     2160
      1350
```

90 Volts

2186 ft. lbs Ja.^{2}

```
163/358830 ( 2
    326
      2
```

Lamp 634.

Resistance cold 235 Ohms
hot 119 Ohms

80 Volts on lamps
2383 ft lbs
14 per H.P. more than
a gas jet.

Lamp 633 lost 10 Ohms

Resistance cold 390 Ohms
hot 205 ohms

83 Volts gas jet or
Kerosene oil burner
1520 ft. lbs.
246 per H. P.

---

634 . jet 14 per H. P.
Gas 2383

Cold 235 Ohms
Hot 119 Ohms

215 Ohm = Resistance

360 on lamp

225 on 215 Ohms

360 : 225 :: 215

225
215
1125
225
450
48375

360) 48375 (134
360
1237
1080
1570

134
15
179

134) 10710 (80
1072

2383) 33000 (14
2383
9170
9532

134 | 338830 (2077
268
708
804
1040
938
1020

119) 283520 (2383
238
455
357
992
952
400

28.9
252.8 Volts
180.

140) 252 (1.04
180
720

25

2.5
2.5
105
50
605

8100
8
00

$\frac{8x^2}{8} = \frac{90^2}{1}$

8
90
720 (27
4
4) 320

133 Full kerosene oil burner
1520 ft. lbs. 205 Ohms
21.6 per H. P. Cold 390
increase 100 Ohms
225 on 215 Ohm
90 Volts

220.

---

220 : 225 :: 215 : 220 Ohms
215
1125
225
450
220) 48375 (219
440
437
220
2170
2980
90

less 15 Ohms
in line with it.

220 Ohms
15
205 Ohms

1520 ft. lbs

220 : 205 :: 90
90
220) 18450 (84
1760
850
660

1520) 33000 (216
3040
2600
1520
10800

205) 312580 (152
205
1075
1025
508
470
460

12 .004

10

.012

6 fibres .00066 diameter

.0000003421 3

6

.0000020526

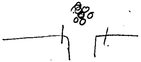
.00001

)143532

~~2~~)358830

1

~~2~~ fibre .004 Diam



800

180

25

3~~200~~)283567~~20~~(~~566~~

~~256~~

295

~~280~~

190

32)28356(884

256

270

256

140

4

3336

1600 m

Manilla fibre

No. 635 Resistance cold 342 ohms
hot

245 = ꝺ on lamps
220 = ꝺ on

88 Volts

245 : 220 :: 215 :
21
220
4300
430
245) 47300 (193
245
2280
2205
750

88
88
704
704
7744
44
30976
30976
193) 340736 (1765
193
1477
1351
1263
1263
1158
1050

1765) 33000 (18
1765
15350

250
23
210
20
190
18
170
160
150
140
130
120
110
100
80
70

60
50
30
20
10

Manilla fibre

No. 636 410 Ohms Cold
236 Ohms hot

220 on 215 Ohms

200 1443 ft. lbs.
23 per H. P

200 : 220 :: 215 :
220
4300
430
200) 473~~00~~
236 Ohms

236) 340736 (1443
236
1047
~~708~~
944
1033
944
890

1443) 33000 (23
2886
4140
4329

88.3 : X :: 91.9 : 82.8
~~88.3~~
27~~8~~7
~~1352~~
~~2352~~
82.8)81~~1477~~

828
88.3
2484
6574.
6574
91.9)7255.2(78
~~14~~
6433
8222

78
78
624
546
6084
662
18252
24326
24336
26952616

82.8)269521(3250
2484
2112
1656
4560

3250)33000(10
3250
500

No. 642 Lamp. 82.8 Ohms hot
73.5 Ohms cold
141
3250 ft. lbs
uncalendered paper 10 per H.P.
paper .015 ~~thick~~
220 on lamps + 9.1 Ohms

275 on 73.5 Ohms

3)265
88.3 Volts

220 : 275 :: 73.5
275
3675
5145
1470
220)2021.25(91.9
1980
412
220
1920

91.9
9.1
82.8

No 643 162 Ohms Cold

Same as No 642 90 Ohms hot

Very bright 3837 ft-lbs.

8.7 per H. P.

220 = D on lamps

280 = D on. 73.5 Ohms

220 : 280 :: 73.5

280

58800

1470

220) 19758.00 (90

1980

3837) 33000 (8.7

30696

23040

88.3

88.3

2649

7064

7064

7796.89

443

2339067

3118756

3118756

90) 3453.9.2.2 27

3837

116.4 : 88.1 :: 2976

1164)34539
~~7228~~
~~344~~
2328
11359
10476
8830
8148
68 0

2976
881
2976
25808
25808
1164)2621856 (14.94
1164
4748
~~4656~~
4668
11100
10476
5240

2441)33000 (13.5
2441
8590
7323
.12670

1494)33000 (2
2988
412

116.4)284185 (2441
2328
5138
4656
4820
4656
1500

No. 642 Good kerosene p.38 50

oil burner 88.1 Ohms hot

2441 ft lbs

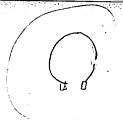
13.5 per H.P.

178 on lamps and 28.3 Ohms

282 on 73.5

178 : 282 :: 73.5
282
1470
5880
1470
178)20727.0 (1164
178
292
178
1140
1068
720

1164
28.3
881



95.4)34539(3621
2862
5919
5724
1950
1808
1420

3144)33000(10.5
3144
15600

95.4 : 83.1 :: 3621
83.1
3621
10863
28968
95.4)3009.051(3144
2862
1470
954
4760
3716
4440

No. 642 Equal to 534
Resistance 83.1 Ohms hot
3144 ft. lbs
10.5 per H.P.

215 = D on lamp + 12.3 Ohms
282 = D on 73.5

215 : 282 :: 73.5
282
1470
5680
1470
215)20527.0(95.4 Ohms
1935
1177
~~75~~
1095
820

12.3
83.1

80.8)34539(4214)33000(7.7
3232 29698
2219 33020
1666
1153
808
3050

250 on lamps
275 on 73.5

(265
88.3

250:275::73.5
275
3675
5145
1970
250)202125(~~84~~5
2000 80.8 Ohms
12125
1000
21.25

Feby 13. 1880

Following experiments are for the prevention of carrying by electrification of the carbon from one side of the carbon horseshoe

70

80

90

100

110 215

130

1400

160

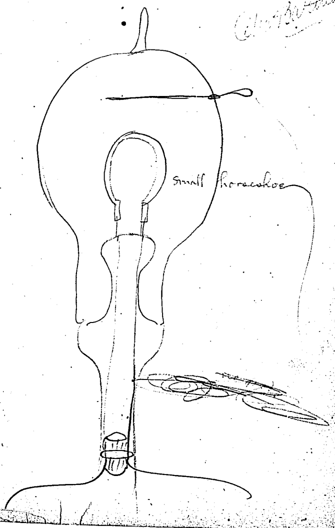
190

200

210

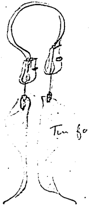
Experiment No. 1. Feby 13 1880

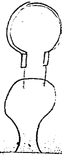
Chas Batchelor



Feby 13 1880.

Large globe small horseshoe





Carbon coated with an oxide,

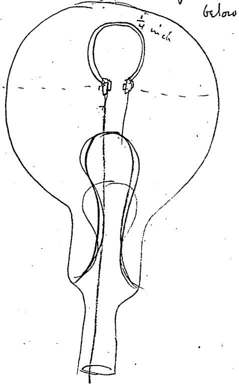
say alumina

or Lime,

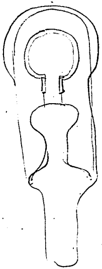
Feby 13 1880 57

Chas Batchelor

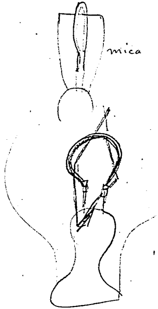
Put up near top to ascertain if coloration goes below dotted line

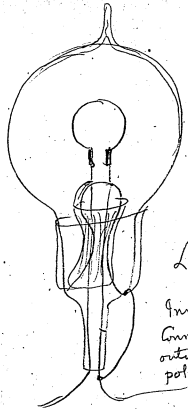


Small globe to ascertain if coloration rapid & to develope other phenomena.



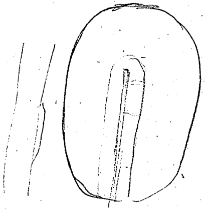
Mica partition, or glass.
Small Carbon





Leyden jar

Innerfoil
Connected to one pole
outer foil to other
pole - idea -
Contrary Specification



~~No 8 Sanseviera Cylindrica:~~

~~First Class, flat. fibrous, shining black - made up of many fibre, - fibres not broken. upon looking closer I find the inter fibre is round. and one fibre twisted on the other like a rope but with a long turn = This ought to be a 1st Class fibre~~

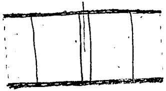
Sansevera Califolia, horrible bad fiber. n.g.

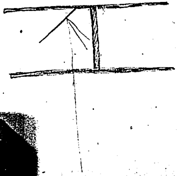
---

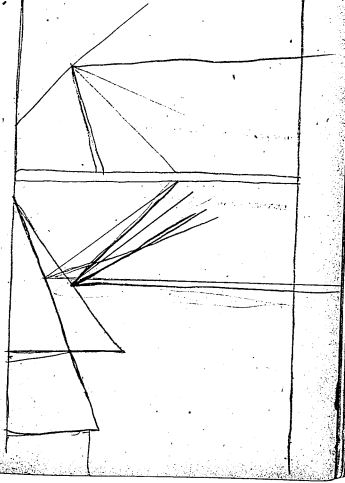
7 Sansevera Califolia.
fair irregular - Shiny
fibrous but coarse fiber

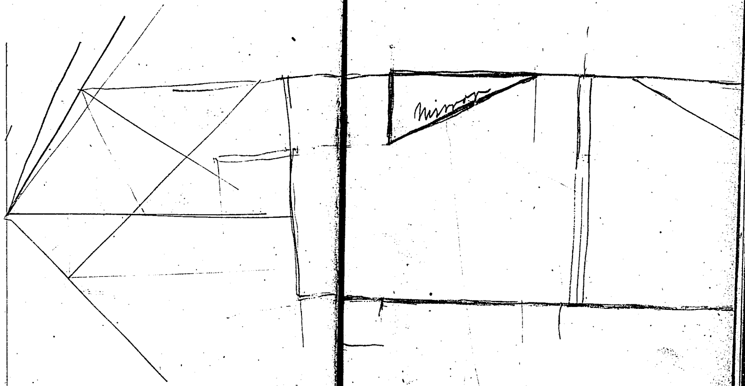
Pineapple fair
good as above
fibers Continuous

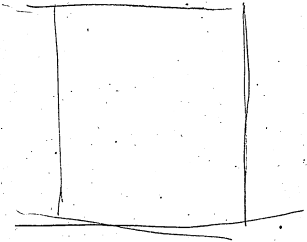
& Sanseveria Cylindrica
Splendid —








mirror



18,5
~~815~~
200
61.5

18.5
18.5
34,225

37822 5

342.)3782(11.0
342
362
342
2000

22 Candles

17

3.10
2.29
41

60
23

57

23
23
69
46
5.29

57
57
399
285
3249

5.29)3249(6.1
3174
750

Good gas jet
12.2 Candles

29m 15 sec

At 30 m [illegible] the sec hand 40

at 31 30 sec

12 grams,

18
16
108
18
[illegible]
2016
1440
2641.6

21
465 28

1.5
4
14.0

65302
40
[illegible]1.2080

.435
185
[illegible]
.109

65302
26120
39182

second hand ups

12 - 4.0
4.8
8

~~7~~30
700
8) 30
3.7

120
60 ⌊240 Grains
4

76

$8x^2 = (80 - x)^2$

$8x^2 = 6400 - 160x + x^2$

$7x^2 + 160x = 6400$

$x^2 + (\ ) + \left(\frac{160}{7}\right)^2 = 914 + 9\cancel{14}$

915
1829

x + 22.7 = 33.4

$x + 22.7 = \pm 38$

$x = 22.7 \pm 38$

22.7
607

793

228
22.8
1884
456
456
519.84

914
570
1485 (38
9
585

38
22.7
15.3

747

23409

558064

37249) 361201 (8
297992

~~$x^2 = 8(80 - x)^2$~~

$8x^2 = (80 - x)^2$

$= 6400 - 160x + x^2$

$7x^2 + 160x = 6400$

$x^2 + 22.86x = 914$

$x^2 + (\ ) + (11.42)^2 = 914 \pm 130 = 1044$ or 784

$x + 11.4 = 32$ ~~11.2~~

$x = 32 - 11.4 = 20.6$

11.42
11.42
2284
4568
1142
1142
130.4164

1044 (32
9
6) 144

59.4

4

42436

) 352836

424) 3528 (8
3392
1360

3h 17' 43"

240 grains

3h 48' 15

120 grains

3 48 15
17 43
30 30

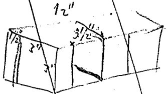
30.5) 120 (3.93
915
2850
2745
1050

3.93
30
117.90

117.9 Grains an hour

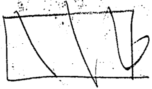
~~Make box 3" X 4½" X 12"~~

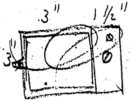
~~Make ends open on one side 3" X 3"~~



~~3½" openning on each side of screen~~

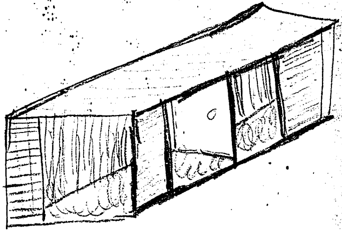
~~Make arrangement of to brass plates to hold screen~~



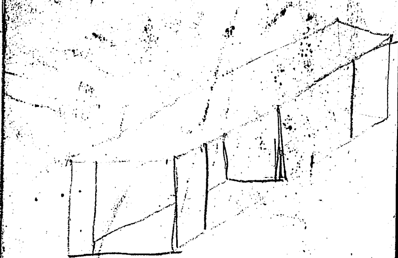


Make box

3" X 4 1/2" X 12" inside



Make box 3" X 4 1/2" X 12"



Make slide for paper
from the front

Hold the box in frame
and mount like picture
in gas lighting so that
the whole arrangement

may be moved ~~back~~
~~[illegible]~~ F.R. Upton,

Faradic armature
no cover .014 in plates
.001 tissue paper

24°
after 15 minute
26
32° after 45 minutes

||

$45\overline{)8.0}(.18$
45
350
350

14167
.18
1133336
14167
2550.06

$2550\overline{)33000}(13$
2550
7500
7650

$\frac{1}{13}$ H.P.

1 5/8

3 2/8
1 5/8

4 7/8
1 5/8

6 1/2

.0353
14
1412
353
.4942

12
12

23

7.4 in
area. 43
11
43
43
473) 1728 (36
1419
3090

1 Litre = How many cu. ft

1 Litre = .0353 cu. ft.
8 litres
.2824

7 Litres

6 1/2
27 1/2

.0353
275
1765
2471
706
.97075

Test gas burner

5h. 47' 0

1 3/4 6h 7
5 47
20

20 minutes 1 3/4 feet
60 " 5 1/4 feet

London Argand

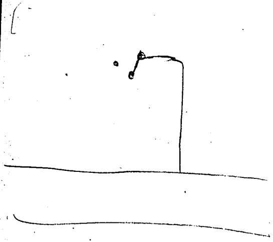
9-41 P.M

1 ft

10-47 2.60
9 41
36 minutes

36 : 60 :: 2.6 :
60
36) 156.0 (4.33 feet per hour
144
120
108
120

10-38 4 feet
9-41
57 : 60 :: 4.0
6
57) 240 (4.21 feet per hour
228
120
114
60



$12^h \cdot 30' - 30''$

60) 25 (401
24
100

1730 grains
40
1690

$12^h\ 40'\ 55$
$12\ \ 30\ \ 30$
$10\ \ 25$

10 : 10.4 :: 1

10.4 : 10 :: 120

104) 120 (1151 Grains per hour
104
160
104
540
520
200

16 90
80 gram
1670

12h 58'

12h 58
12 30
28

~~27.5 : 28 ::~~

28 : 27.5 :: 120
120
5500
275
28) 3300.0 (117.8 Grains
28
50
28
220
196
240

586
214)58.6 (2.74
428
1580
1498
820

2.74
2.74
1096
1918
548
7.5076
2
15.6

Large flame

15 candles

62
18)62 (3.44
54
80
72
80

3.44
3.44
1376
1376
1032
11.8336
2
23.66

23 2/3 candles
Full flame

54.1

259)54.1(209

548

2300

209
209
1881
418
41861
2
419
2
8.38

8.38 candles

51.8

282)51.8(184

282

2360

2256

1040

1.84
1.84
736
1472
184
338.56
2
6.76

6.76 candles

6.76 candles tested against two candles
7.02 " " " one "

58.1

219)58.1(2.65

438

1430

1314

1160

2.65
2.65
70225

7.02 candles

Last flame with one candle

E. L.

53.4

266)53.4(200

532

200

4

8 candles flat side

120 Lamps Regular ?

190 R

120 : 190 :: 93
190
8370
93
120) 17670 (147 Ohms
120
567
480
870

3 / 282
94 Volts
94
366
846
8826
44.3
26478
64

147) 383 1358 (2560
294
891
735
1560

2560 ft. lbs. 8 candles

2560) 33000 (12.7 per H.P.
2560
7400
5120
22800

42
38) 42 (1.10
38
40
38
20

1.1
1.1
1.21
2
2.41 Candles

105 : 155 :: 93
93
465
1395
105) 14415 (137 Ohms
105
391
315
765

100 : 160

~~94 : 170~~ Connecting wire .65 Ohm

120 : 190

---

108 : 155 :: 93
93
465
1395
108) 14415 (1
108
361

~~105 : 150~~

120

115 : 200

110 215

125

120 : 215 :: 93
93
645
1935
12) 19995
166

168 Ohms

166) 283000 (1700 ft. lbs
166
1170
1162
80

1 - 2.41 Candles

170 : 256 :: 2.41 :

60.5
19.5) 60.5 (31
585
200

31
31
31
93
961
2
19.2 Candles

172 : 225 ::
175 : 245
205 : 290 :: 93 :
93
870
2610
205) 26970 (1.099 Ohms
205
647
638
190

150 : 225 :: 93 Regular }
93
675
2025
150) 20925 (135 Ohms
150
592
450
1420

150

3 (315 Volts
105

90 : 175 ::

3440) 33000 (9.6
30960
20400

119 : 182 :: 93
93
546
1638
119) 16926 (142 Ohms
119
502
476
260
238
2

19.2 Candles

142) 488.400 (3440
426
624
568
560

94 Volts

11

102 : 164 :: 93 Regular
93
492
1476
102) 15252 (149 Ohms
102
505
408
972

149) 391440 (2626
298
934
894
404
298
1060

2626) 33000 (12.5
2626
6740
5252
14880

12.5 8 candles

80 Volts.

---

85 : 139 :: 93
93
417
1251
85) 12927 (152 Ohms
85
442
425
177

: 138 :: 145 :: 93
93
435
1305
38) 13485 (97.7 Ohms
1242
1065
966
990

125
85

22
8
17.6

68.5
185) 615 (332
555
600
555
450

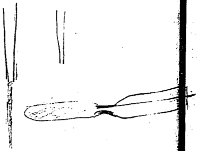
332
332
664
996
996
110254
2
22 candles

17.7) 20.070 (3270
2931
2697
1954
7430

3270) 33000 (10.2
3270
8000

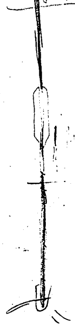
56.1
23.9)56.1(2.34
478
830
717
1130

234
234
936
702
468
54756
2
16.94



59.5
205)59.5(2.9
410
1850
1841

2.9
2.9
261
58
841
2
16.8 Candles



83 volts

59.7
3

---

17 scale for resistance
10 lamps

137 8 147
10 17
127 : 130 :: 93

127 : 130 :: 93
130
2790
93
127) 12090 (93 Ohms
1143
560

93) 305180 (328
279
268
186
825
32

158 : 170

March 6 Lamp 774
R 207
2-30 A. M

Took abt 40 grains

2 39 40

.4575
.502
3.8895
49.47
30.53) 4947 (1.6
3053
1894

1.6
1.6
96
16
25
2
5.12

108.1166.1.93.51
935
830
748
78
10.) 15521.5 (144 Ohms
108
472
432
401

Candles

144) 358800 (2480
288
708
576
1220
2

2480) 33000 (13.3
2480
8200
7440
7600

13.3 per H. P.

100

.07) 100.00 (
1428.

1/1000

.008 in

9.718
0.0971

1428
.0971
1428
9996
12852
4 | 138.6608 Ohms
34.8 Ohms
2
69.6 Ohms

49

50.25 Broad side
50.75
51.00
5.7 Candles

10°
No change 5.7
20°
50.75 5.7
30°
50 3/8 5.5
40°
50 5.24
50°
48 3/4 4.50
60°
47 1/2 3.92
70°
45 3.38
80°
42 2.41
1.80

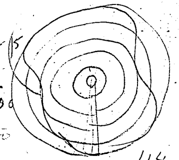
506
294) 506 (168
294
2020
1764
2560

1.68
1.68
1344
1008
168
2.8224
2
5.7

30) 50 (1.62
30
200
180

1.62
1.62
324
972
162
2.6244
2
5.24

48.75
31.25) 48.75 (1.5
31.25
17500
125
200



1.5
1.5
75
15
2.25
2
4.50

47.5
32.5) 47.5 (1.4
32.5
150 0 1.1

1.14
1.4
456
114
1.96
2
3.92

45
35) 45 (1.3
35
100

3
2
3.58

38) 42 (1.1
38
20
1.21
2
2.41

112 : 168 :: 93.3
935
840
504
1512
112 | 15708.0 (140 Ohms
112
450
448
28

---

108 : 165

500
570 : 500 :: 520 50
5.7 / 23000 (44
228
220

~~877~~
538
~~.877~~
2366
2366
2704
296426

570) 500.0 (.877
4560
4400
3990
4100

.877
55
4385
4385
48235

241
877
1687
1687
928
11357

.877
524
3508
1754
4385
459548

.877
45
4385
3508
39465

877
392
1754
7893
2631
343784

6 X 400

600
100
200
100
100
280
———
1380

70% of the light from the

broad side

250
3.14
———
1000
250
750

$4\overline{)78500}$

$1980\overline{)13800}(70$
13860
———

70%

$X^2 = n(80 - \ )^2$

$X^2 = \cancel{80n}$ 80
$6400n - 160nx + nx^2$

$x^2 - nx^2 + 160nx = 6400n$

$(n-1)x^2 - 160nx = -6400n$

$x^2 - \frac{160n}{n-1}x + \left(\frac{80n}{n-1}\right)^2 =$

$= + \left(\frac{80n}{n-1}\right)^2 - 6400n$

~~$= 80n \; \frac{80n^2 - 6400n^3}{n^2 - 2n + 1}$~~

$x - \frac{80n}{n-1} = \pm\sqrt{\left(\frac{80n}{n-1}\right)^2 - 6400n}$

$x = \frac{80n}{n-1} \pm \sqrt{\left(\frac{80n}{n-1}\right)^2 - 6400n}$

$x = \frac{80n}{n-1} \pm \sqrt{\left(\frac{80n}{n-1}\right)^2 - 6400n}$

$n = 1$

$x = 48$

~~[illegible]~~

80

$n = \frac{1}{2}$

$x = \frac{40}{-\frac{1}{2}} \pm \sqrt{}$

$= -80 \pm \sqrt{6400 - 3200}$

$x = -80 \pm \sqrt{3200}$

$x = -80 + 56.5 = -23.5$

$x^2 = \frac{1}{2}(80-x)^2$

$= 3200 - 80x + \frac{x^2}{2}$

$\frac{x^2}{2} + 80x = 3200$

$x^2 + 160x = 6400$

$x^2 \ldots 6400 = 12800$

$x = -80 \pm \sqrt{\ldots}$

160
160
960
160
25600

$n = 2$

$x = \frac{160}{1} \pm \sqrt{25600 - 12800}$

12800
12800

$= 160 \pm 113$

113.1
47
47

$x = 47$

3.3

47 2209
33 1089
2198

1849 1369

4 candles 46.9
33.1

$$x^2 = n(80-x)^2$$

$$x^2 = n(6400 - 160x + x^2)$$

$$= 6400n - 160nx + nx^2$$

$$-nx^2 + x^2 + 160nx = 6400n$$

$$(n-1)x^2 - 160nx = -6400n$$

$$x^2 - \frac{160n}{n-1}x + \left(\frac{80n}{n-1}\right)^2 = \left(\frac{80n}{n-1}\right)^2 - 6400n$$

$$x - \frac{80n}{n-1} = \pm\sqrt{\left(\frac{80n}{n-1}\right)^2 - 6400n}$$

$$x = \frac{80n}{n-1} \pm \sqrt{\left(\frac{80n}{n-1}\right)^2 - 6400n}$$

$n = 2$

$$x = 160 \pm \sqrt{160^2 - 6400}$$

6400
2
12800

160
160
96 00
16
256 00
12 800
12 800

~~$x = \frac{80n}{n-1} \pm \sqrt{\left(\frac{80n}{n-1}\right)^2 - 6400n}$~~

$n = 1.5$

$n - 1 = .5$

$\frac{80n}{n-1} = 2400$

1.5
80
120.0
2
240.0

2400
2400
576 0000
9600
48000

6400
1.5
32000
64
96 000

6

$x = 240 \pm 219 = 21$

21
21
21
42
441

$80 - x = 59$

59

$n = 1.5$

$x^2 = 1.5(80 - x)^2$

$= \frac{3}{2}(6400 - 160x + x^2)$

$2x^2 = 19200 - 480x + 3x^2$

$x^2 - 480x = -19200$

$x^2 - (\ ) + 57600 =$

$x = 240 \pm \sqrt{38400}$.

240
240
9600
480
57600
19200
38400

1959
46.1
15.9

2025
1225
61
1835

1994
1288
644
1932

$n = 1.5$

$x^2 = n(80 - x)^2$

$x^2 = n(6400 - 160x + x^2)$

$= 6400n - 160nx + nx^2$

$x^2 - nx^2 + 160nx = 6400n$

$(n-1)x^2 - 160nx = -6400n$

$x^2 - \frac{160nx}{n-1} + \left(\frac{80n}{n-1}\right)^2 = \left(\frac{80n}{n-1}\right)^2 - 6400n$

$x - \frac{80n}{n-1} = \pm\sqrt{\left(\frac{80n}{n-1}\right)^2 - 6400n}$

$x = \frac{80n}{n-1} \pm \sqrt{\left(\frac{80n}{n-1}\right)^2 - 6400n}$

$n = 1.5$

1.5
80
120.0
2
240

$\frac{80n}{n-1} = 240$

$(n-1)x^2 - \frac{160nx}{1} = -6400n$

$x^2 - \frac{160nx}{n-1} = -\frac{6400n}{n-1}$

$x^2 - (\quad) + \left(\frac{80}{n-1}\right)^2 = \left(\frac{80n}{n-1}\right)^2 - \frac{6400n}{n-1}$

$= \frac{6400(x-n)}{(n-1)^2}$

$\cancel{= \frac{6400}{n-1}}$

$= \frac{6400n - 6400n^2 + 6400n}{(n-1)^2}$

$= \frac{6400n(-n^2+n+1)}{(n-1)^2}$

$= \left(\frac{80}{n-1}\right)^2 - \frac{6400n}{n-1}$

$X = \frac{80n}{n-1} \pm \sqrt{\left(\frac{80n}{n-1}\right)^2 - \frac{6400n}{n-1}}$

$n = 1.5$

$\frac{80n}{n-1} = 240 \pm$

$\frac{n}{n-1} = \frac{1.5}{.5} = 3$

$6400 \times 3 = 19200$

$240^2 = 57600$

19200

$\sqrt{38400} = 195.9$

$X = 240 - 195.9 = 44.1$

$80 - x = 35.9$

3 candles	44.1
2 candles	40.
4 candles	46.9

$n = 2.5$

$$x = \frac{80n}{n-1} \pm \sqrt{\left(\frac{80n}{n-1}\right)^2 - \left(\frac{6400n}{n-1}\right)}$$

2.5
80
200.0
1.5
300

$\frac{80n}{n-1} = 300$

$(\ )^2 = 90000$
10666
79334

6400
2.5
32000
1.28

1.5) 16000.0 (10666.
15
100

300 281

15) 200 (133
15
50
45

17800
10666
7134 (84
64
164) 734
656
) 9300

7134 (84.4
64
164) 734
656
16.8.) 7800 84.4

$x = 133.3 - 84.4 = 48.9$

$80 - x = 21.1$

44521.
239121.

$$x = \frac{80n}{n-1} \pm \sqrt{\left(\frac{80n}{n-1}\right)^2 - \left(\frac{6400n}{n-1}\right)}$$

5 inch belt
10 inch pulley

1000 revs
12 / 31400
2617 ~~ft. m~~ ftpm

1 inch 600 ft pm 1 H. P

600 / 2617
4.36 H
5
21.60 H. P.

5 inches

2 / 31.4
15.7
5
78.5

2617
1308
785
6540
10464
9156
33000 / 102678.0 (3.1
99
36

3.1 H. P.

$$w = \frac{H.P. \times 3660}{v \times c}$$

$$H.P. = \frac{wvc}{3660}$$

$144 \overline{)\,78.5}\,(54$

~~76~~

720

650

556

940

$w = 5$

$v = 2617$

$c = .548$

548
5

2740
2617

19180
2740
16440
5480

$3660 \overline{)\,7170580}\,(1.9$

3660

3510

$$X = \frac{80n}{n-1} \pm \sqrt{\left(\frac{80n}{n-1}\right)^2 - \left(\frac{6400n}{n-1}\right)}$$

$n = 2.5 \qquad n - 1 = 1.5$

80

$1.5 \overline{)\,200.0}\,(133.3 = \frac{80n}{n-1}$

15

50

45

$133.3^2 = 17700$

10666

7034 (83.8

64

$163 \overline{)\,634}$

489

14500

6400

2.5

320000

$1.5 \overline{)\,16000}\,(10666$

15

100

90

13

$X = 133.3 - 83.8$

83.8

49.5

5 candles 205

$n = 3$ $n - 1 = 2$

$$x = \frac{80n}{n-1} \pm \sqrt{\left(\frac{80n}{n-1}\right)^2 - \left(\frac{8400n}{n-1}\right)}$$

$2 \overline{)240}$ $= (\;)^n$ $14400 = (\;)^2$

120

$2 \overline{)6400}$

3200

3

9600

$\frac{9600}{\sqrt{4800}} = 69.28$

1.20

69.28

50.72

6 candles 19/28

$n = 7$ $\int_{\cos}^{90}$ $n - 2 = 5$

$$X = \frac{160n}{n-2} + \sqrt{\left(\frac{160n}{n-2}\right)^2 - \frac{25600n}{n-2}}$$

$X =$ $\frac{160}{7}$ ~~800~~

$5 \overline{)1180}$

236

25600

7

$5 \overline{)179200}$

35840

55696

35840

$\sqrt{2\,98\,56}$ $(172.5$

1

$27)\;198$

189

$342)\;956$

684

$344)\;17200$

236

172.5

$2 \overline{)63.5}$

31

$x^2 = n(160-x)^2$

$x = \frac{160n}{n-1} \pm \sqrt{\frac{160n}{n-1} - \frac{\overset{25600}{\cancel{6400}}n}{n-1}}$

$n = 7 \qquad n-1 = 6$

160×7

$6 \,)\, 1120$

186.6

186.6×186.6

10596

10596

14928

1866

34753.56

25600×7

$6 \,)\, 179200$

29866

$- 29866$

$4887 \,(\, 69.9$

36

$129 \,)\, 1287$

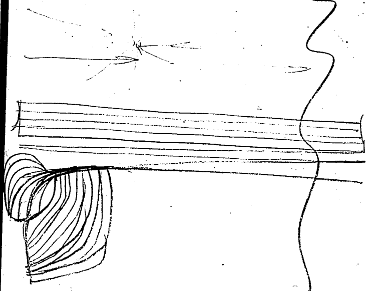
1161

$126 \,)\, 12600$

$186.6 + 69.9$

$2 \,)\, 167$

58



Double current
2 had heat

$\frac{1}{2}$ · $\frac{1}{4}$ · $\frac{1}{4}$

1 × 1 × 44 ÷ 1 ohm = 44

~~2~~ × ~~2~~ × 44 ÷ 1 ohm

176

176

---

1 volt = 1 weber heat. 1 weber 3 in. = 1

$\frac{1}{2}$ 2 in c $\frac{1}{2}$

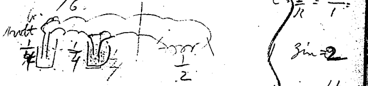
$\frac{1}{4}$ weber $\frac{2}{4}$ $\frac{1}{4}$

$\frac{1}{4}$ $\frac{1}{4}$

$\frac{4}{16}$ $\frac{3}{16}$

$\frac{1}{16}$

$C = \frac{E}{R} = \frac{1}{1}$


1 volt
1/4
1/4
1/4
1/2

3 in = ~~2~~

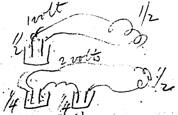
4

1 volt each

2

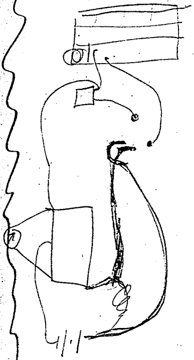
1

2 + 2 = 4


1 volt
1/2
1/2
2 volts
1/2
1/4
1/4

2

2



Brushes put up. no charge on the dy.

Results Photometer

Fibre coated with plumbago

Resistance hot 57.4 Ohms

Candles Broadside 19 candles

Edge 16 "

Average 18 "

Ft lbs consumed 3003

11 per H. P. in current

176 candles in 11 places

Resistance hot 54.7 Ohms

Broadside 24.5 candles

Edge 20 "

Average 23 "

3600 ft lbs

9.1 per H. P in current

211 candles per H. P.

in 9.1 places

Regular large carbon No 618

Resistance hot 87.7 Ohms
cold 150. —

Broadside 20 candles
Edge 8 — .
average 15.4 —

Consumed 4320. ft. lbs.
7.6 or H.P. in current

114 candles in 7.9 places

Remarks Perfect carbon, has burned 1000 hours, glass moderately clear. No sign of irregularity at red heat

Small carbon No. 813

Resistance hot 112.4 Ohms

Broadside 25 candles

Consumed 3246 ft. lbs.

10.16 per H.P.

another small loop another time.

broadside 23.5 candles

8 per H.P.

188 candles broadside in 8 places

142 " average "

Bast fibre lamp No. 705

Resistance cold 225 Ohms hot 122.5 Ohm

Broadside 15 candles

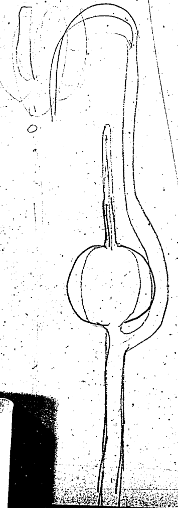
Average 14 candles

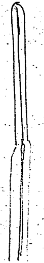
3840 ft lbs

8.6 per H.P.

120. candles in 8.6 places

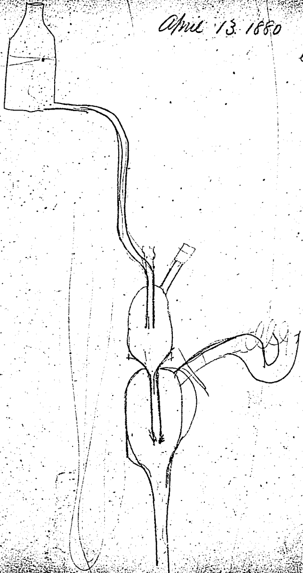
April 13 1880



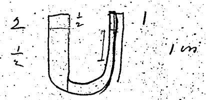


April 13 1880

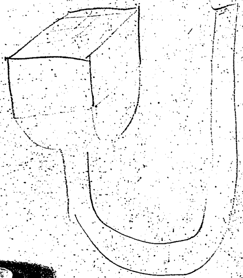
Cem



1lb.
10ft.



120—



Candles	Deflection
22	130
17½	120
15	125
15	115
15	115
11¼	100
11	112
10	
9¾	102
9½	108
9¼	90
8¾	[illegible]
[illegible]	
[illegible]	[illegible]

Pt. wire .005 in. in diameter

~~five at~~ R = 1.8 ohms

five cells of condit and Hanson

21 on photo as against 1 candle

21
21
21
42
421

59
59
531
295
3481 (8.2
3368
1130

$\frac{1}{8.2}$ candle

16 1/2 candles face

L.R. 198
H.R 295

on 81.5 ohms 235 =

2

85
3
255

New loop carbon large

all 12 candles.

	H.R.	L.R.	
1	280 ✓	192	219 on 81.5 ohm
2	272 ✓	192	289.
3	299 ✓	179	
4	265 ✓	185	265 H.R
5	290 ✓	172	205 L.R
6	275 ✓	185	
7	276 ✓	185	
8	287 ✓	175	
9	278 ✓	185	
10	290 ✓	172	
11	290 ✓	178	
12	275	188	

No 1

280 192

216 2.33445
81.5 1.91116
amts 192 7.71670

91.7 ohms 1.96231

3 ⟌280
93.3 Volts 1.96988
1.96988
1.64640
.8.03769

3.62385
4200 4.51851

.89466

7.8

No. 2

272 H. R
192 L. R

~~2.33445~~
~~1.91116~~

91.7 ohms

90.6 Volts 1.9574
1.9574
1.6464
8.0377

3970 3.5989
5.185

.9796

8.3.

299 H. R
179 L. R
232 on 81.5

232 2.3655
81.5 1.9112
Comp. 179 7.7471
2.0238
100 Ohms

99.6 Volts 1.9983
1.9983
1.6464
7.9762
3.6192
4160 4.5185
7.9 .8993

---

265 H. R
185 L. R
205 on 81.5 Ohms

205 2.3117
81.5 1.9112
Comp. 185 7.7328
90 1.9557

88.3 Volts 1.9460
1.9460
1.6464
8.0443
3.5827
3830 4.5185
8.6 .9358

290 H.R
172 L.R
225 on 81.5

225 2.3522
81.5 1.9112
amps 172 7.7645
100 2.0279
96.6 Volts 1.9850
1.9850
1.6464
7.9721
3880 3.5885
4.5185
8.5 .9360

---

275 H.R
185 L.R

No 6

214 on 81.5 Ohms

214 2.3304
81.5 1.9112
amps 185 7.7328
94.3 Ohms 1.9744
91.6 Volts 1.9619
1.9619
1.6464
8.0256
3940 3.5958
4.5185
8.4 .9227

4000 ft lbs No. 7
8.4 per H.P.

No. 8

287 H. R

175 L. R

212 on 81.5

212	2.3263
81.5	1.9112
comp 175	7.7570
	1.9945
98.7 Ohms	
95.6	1.9805
	1.9805
	1.6464
	8.0055
	3.6129
4100	

No 9

278 H. R.

185 L. R.

215	2.3324
81.5	1.9112
comp 185	7.7328
	1.9764
94.6 Ohms	
92.6	1.9666
	1.9666
	1.6464
	8.0236
	3.6032
4010	

No 10
290 H.R.
172 L.R

225 2.3522
81.5 1.9112
comp 172 7.7645
2.0279
106 Ohms

96.6 Volts 1.9850
1.9850
1.6464
5.6164
7.9721
3.5885

3880

No 11

290 H.R
178 L.R

225 2.3522
81.5 1.9112
comp 178 7.7496
2.0130
103 Ohms

96.6 Volts 5.6164
7.9860
3.6024

4000

No. 12

275 H.R

1.88 L.R

212 2.3263

81.5 1.9112

Comp 188 7.7257

92 1.9632.

91.6 1.9619

1.96.19

1.6464.

8.0368

36070

4040

Table for large loops now made
May 1, 1880. These lamps all
gave 12 candles

	Ohms	Foot lbs	12 candles per H.P.
1.	93.3	4200	7.9
2	90.6	3970	8.6
3	100	4160	8.5
4	90	3830	8.4
5	100	3880	8.4
6	94.3	3940	
7	94.3	3940	
8	98.7	4100	
9	94.6	4010	
10	106	3880	
11	103	4000	
12	92	4040	
		12 | 47950	8.44
		3912	

4.5185

3.5922

[illegible].9263

Wood lamp cut from
veneer .020 in. thick 103 ohms cold

77 Ohms in resistance

H.R	L.R. on 77 ohms
258	191
265	198
280	204-206
301	221
268	197
245	180
219	161

780

May 4

220 : 187 :: 77
77
13.09
1309
220)1439.9(65 Ohms
132
119
110
.9

On lamps

HR	L.R		Candles
210	173-174		2
208	172		2
212	178		2.5
224	189		3.6
230	200	Face	4.7
		Edge	3.25
248	220		7.6

on 77 Ohms 187

276	250	17.25
273		

78 Ohms

May 4

179

82
82
164
656
6724
44
26896
26896
56) 295856 (5300
280
158

~~245 : 180~~

180 : 248 :: 77 158
77
1736
1736
180) 19096 (

248 : 180 :: 77
180
6160
77
248) 13860 (56
1240
1466

Norden lamps
28 candles
285 on L.R
276 on H.R

	L.R.	H R	Candles dumpshot
1	243	245	12
2	264	242	12
3	250	234	12
4	237	237	12
5	235	280	12
	1228	5) 1238	
	246	248	

~~245~~

237 : 186 :: 77

1.8865
2.2695
7.6253

60.4 Ohms 1.7813

(237

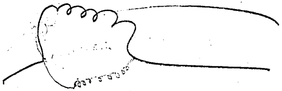
79

1.8976
1.8976
1.6464
8.2187

3.6603

4560.

Thomas A Edison



June 9 1880

11 candles test fibre

3)250
83.3

1.9206
1.9206
1.6464
8.0336
3.5212
1.0414
2.4798

301 ft. lbs.

110 : 117 :: 87

1.9395
2.0682
7.9586
1.9663

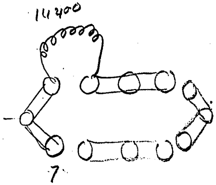
15 candle 8 per H.P

110 candles per H.P

110)33000
300 ft-lbs. per candle

4 Volts will make about 3+ candles difference in a lamp which is giving 8 per H. P. of 15 candles

Lamps in bridge



126.40
22,20
7.60
156.20
78,10

12.640 Wooden lamp
2200
14840
7300
2.2140
110.70 Ohms

14.840
50
14890
74.85 Ohms Burst

14840
6000
20840
104.20

14.840
5880
20960
104.80

20 Volts

20840
6300

Volts	
26	5600
32	4600
66	1700
80	~~1500~~ 1450
90	720

6300
2

12600
1400

14000

12600

12600
3

37800
2220

40000
4000

44000

220.

70.2
200

14040.0

14020

12620
1400

14020

E-M.F

15 Volts 220 Ohms

First light red

26 Volts 202 Ohms

Bast 0".009 × 0".012

May 14. 80

Lamp 1135 Bast fibre; cut from large fibre by new clamps made by Bradley 4 inches long 0".009 × 0".012 before carbonizing

1135 240 Ohms

1136 225 Ohms

W. U. Boxes

End connection bad

Box 1 6250
6250
12500

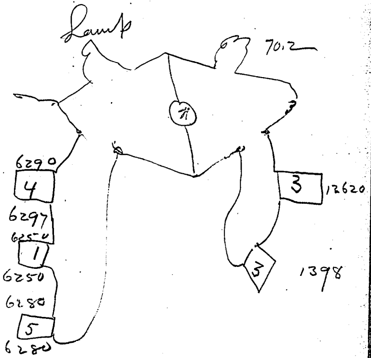
Box 2 6285
6295
12580

Box 3 6330
6290
12620

Box 4 6290
6297
12587

Box 5 6280
6290
12570

No 1135


Lamp
70.2
6290
4
6297
6250
1
6250
6280
5
6280
3
12620
3
1398

12579
12587
12500
37666

Lamp No. 1135

37660
02220
39880
3580
43460
217.30

Volts
3|47
15.6

3|72.5

Just red

3|87

217.3 Ohms

39880
1050
40930
204.65 Ohms

39880
6250
33630
6200
39830
199.75

15
8
120

120 (33000
275 ft. lbs.

4:
5.44
9.44

1/4 more candles for total
1/3 more " for candle burning to much
1/4 + 1/3 = 7/12 more to add

19 1 2788
1.0792
.1996

86 1.9345
86 1.9345
44.3 1.6464
Comp 158.85 7.8113
3.3267

3,16 .4997
.1996
5, .6993

5 (2120
424

Lamp No 1135
Rapping Lamp no diff
Volts
(100
33.3

33.630
5200
(38830
194.15 Ohms

Yellow
3(135

33630
2800
(36430
182.15 Ohms

3(225
75

33630
6250
27380
5370
(32750
163.75 Ohms

(2596
257R
3(258
86

in all 64.7R
65.5
$3\frac{1}{6}$ candles

27380
4390
(31770
158.85 Ohms

5.5
2.7
8.2

1280
93 1.9685
93 1.9685
1.6464
154 7.8125
2480 8.3959
5.885
1.1226

B.2

4
6021
.1996
6.33 .8017

90 1.9542
90 1.9542
44.3 1.6464
Comp 156. 7.8069
3.3617
.8017
2.5600
360 ft lbs per candle

6.2 .7924
.1996
9.8 candles .9920

97.3 1.9881
97.3 1.9881
1.6464
153.4 7.8141
3.4367
.9920
278 ft lbs per candle .4447

Lamp No. 1135
257 L
2 7/8 candles
158.85 Ohms

1270 L
90 Volts
270 R
4 candles

27380
3900
31280
156.40 Ohms

282 R
11-39 2
3500 Ohms
5 1/2 candles
285 L
154.40 Ohms

11-42 293 L
3200 Ohms
153.40 Ohms

11-44 292 R
6.2 candles

108.1 2.0338
108.1 2.0338
44.3 1.6464
Comp 14.7 7.8327
3.5467

3530 ft. lbs

4.5185
3.5467
9.37 .9718

~~118.6 2.0738~~
~~118.6 2.0738~~
~~44.3 1.6464~~
~~146.9 7.8320~~
~~3.6260~~
~~4230 4.5185~~
~~8915~~
~~7.8~~

171.2304
0.1996
14300

27 candles all round

---

295 L Lamp No. 1135

11-46 325 L
108.1

21560 Ohms

27380
2150
29530
147.65 Ohms

11-48 322 R
14.5 Candles
325 L

11-51 337 L

27380
1850
29430
147.15

1850

11-55 340 R
17 candles

146.5

~~29 candles~~
~~355~~
~~188.6~~

~~146.5~~ Ohms

$2\frac{5}{8}$

~~2.625~~
~~2.625~~
3.66
4
4
4.25
4.5
4.12
3.5
$7\overline{)28.03}$
4.

5.5
5.66
5.5
5.12
$4\overline{)21.78}$
5.44

4 : 5.44 :: 9 : 12.24
9
$4\overline{)48.96}$
12.24

0".009 broadside
0".012 Edge
$\frac{4}{13}$ inches long
shrinks $\frac{13"}{16}$

1714 grams Wt. of candle

1-51 Lighted

1-5-8 275 R
20 cells 65 R
278 L
$2\frac{5}{8}$ candles
4600 Ohms

27380
4600
$20\overline{)31980}$
159.90

2 — 280 L
280 R
$2\frac{5}{8}$ candles

2-3 295 R
$3\frac{2}{3}$ candles

2-5 295 L
4 candles
4300 Ohms
4 candles Broadsid

Lamp No. 1135

2-7 5 1/2 candles edge
5 2/3 " "
296 L
5 1/2 candles edge
2-10 297 L.
4 1/8 candles broadside
295 R
4350 Ohms
4 1/2 candles broadside
297 R
2-13 300 L
2 15 300 L
298 R
4580 Ohms
5 1/8 candles Edge
4 1/8 candles Broadside

35.5
9
44.5

1714
147.9
235 grams

44.5 : 60 :: 235 : X

2.3711
1.7782
8.3516
2.5015

2 | 317 grains
158.5

240 : 317

317 2.5015
240 23802
.1213

1.32 times the candle power read

add 1/3 to candles read

Lamps No. 1135

2-22 295 R
4800 Ohms
5100 Ohms

2-30 299 L
3½ candles
Circuit broken and made
no change in zero

2-31 345 L
12 + candles
2-35-30 blowed air candles
1479 grains Wt candles
Waiting for motor
Lamp brought up very high

32
24

$\frac{1}{3}$ longer

Lamp No. 1135

page 138
9.8 candles at the rate of 8 per H. P.

9.8 : 15 :: 1 : 1.53

11761
9912
0.1849

1.53
21
153
306
3.213

1/2 again as much surface to give 8 per H.P.

$\begin{array}{r}12\\12\\\hline 144\end{array}$ $\begin{array}{r}12\\9\\\hline 108\end{array}$ $\begin{array}{r}12\\9\\\hline 21\end{array}$ $\begin{array}{r}12\\12\\\hline 24\end{array}$

21

Ohms
144 : 108 :: 154

115 Ohms

32
24

154 Ohms

2.1875
2.0334
7.8416
2.0625
11.0051
8.6198
2.1874

Page 141

17 candles

27 candles corrected

1339.
113

2.0531
2.0531
1.6464
Ohms 1474 7.8327
3.5853
27 1.4314
2.1539

142 ft. lbs. per candle

21 24

Lamps No. 1135

after burning at 19 candles for eight hours one side bad

11-26
280 L
1330 Ohms
5 3/4 candles
287 R

27380
1330
28710
14355

11-40
295 R
1270 Ohms
291 L
7 candles

330 L
300 Ohm
17 Candles

27380
300
2 | 27680
13840

1256.
1095.4
160.6
2
321.2

Lamp. No. 113 B
1256 grams wt candles

1-50 · 10	Lighted candle
1-53	125 L 8700 Light red
1-55	275 5 candles broadside 295.0 Ohms 269 L
2 —	305 L 1700 ohms 307 R 10.5 candles 301 L

Lamps 1138

2.3 325 L
0 Ohms
330 R
19.5 Candles

2-10 340 R
Less 6280 Ohms
$\overset{50}{2}$600 Ohms
335 L
25 candles broadside
30 candles Edge
2-20 26 " broadside
2-20 Stopped candles.
2-23 5750 Ohms

Lamps No. 1738

2.24 334 L

337 R

Zero 1 R

20 cells

65 R

2.27 62.7 L

2.32 5970 Ohms

Candles 1095.7

2.40 reversed

6600 Ohms

went with beautiful blue phosphorescence eating away the carbon

Lamp No. 1137

All boxes
+ 8000 Ohms cool

280 Ω
7½ candles

7000 + 27380
Went with blue phosphorescence

307
102.

2.0086
2.0086
1.6464
73.2 8.1355
3.7991
6300 4 .5563
.7572
5.7 feet H.P.

17.7
2
35.
17
52

Wooden Lamp

1600 Ohms

6290
6297
6280
2220

65·1/4 inches

6290
6297
1220
850
14657
73.2

305 L
310 R

80
65.25
14.75

3.6258
2.3376
1.2482

78129
2
3.6258
.1664
2
2.3376

198 144

Sodium 3° 58'

Line 2° 15'

The one with the glass Solution. 6 inches ~~with~~ at 20 candels. and fourteen at 27 C

.250

88.3 : 1.9206
83.3 1.9206
443 1.6464. 5185
Comp 84.4 8.6737 5613
3.5613 .9572

3640 ft. lbs.. 9.06 per H.P.

12 candle fuse

5.49 Edge

90 1.9542
90 1.9542
1.6464
82.4 8.0891
3.6389
4350 .5185
.8796

7.57 per H.P.

Old reigulan
form lamp post slightly black

386
155
529

8 candles + 1/2 12 candles
3 2/3 5.49 ?

250 H.R

2100 2100
2200 2200
6290 6290
6297 6297
16880
84.4

1700 6290
2200 6297
3900 3900
16487
270 H R 82.43

16 candles
17

65 1.8129
1.8129
1.6464
40 8.3978

3.6750
4730 4.5185

.8435

560

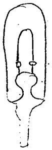
50 to 16 cells
188 = D

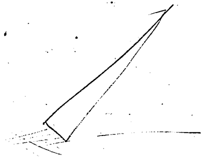
June 18, 80

$\frac{50}{16}$

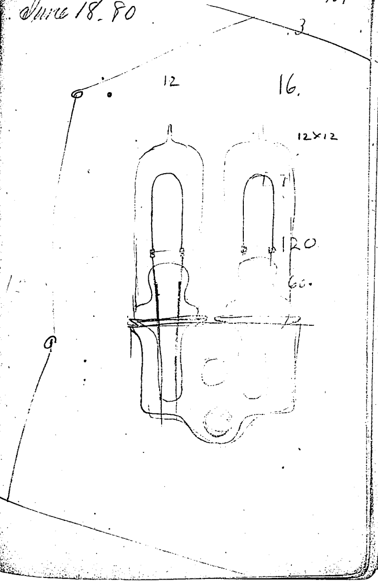
2 | 6.5
3.25
4

13.00

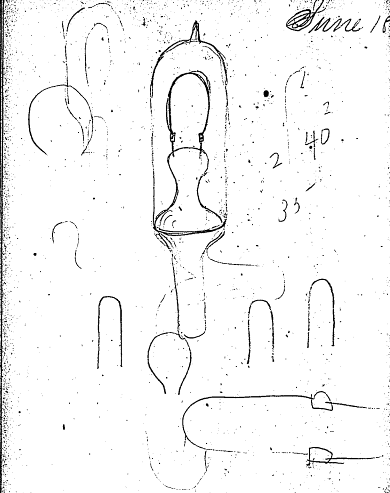




June 18. 80

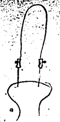

3
12
16.
12×12
120
60.

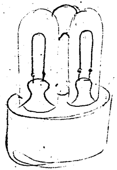
June 18

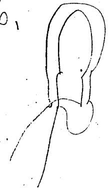


June 18

16,







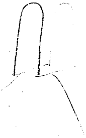
35

50

25-0

50.

25



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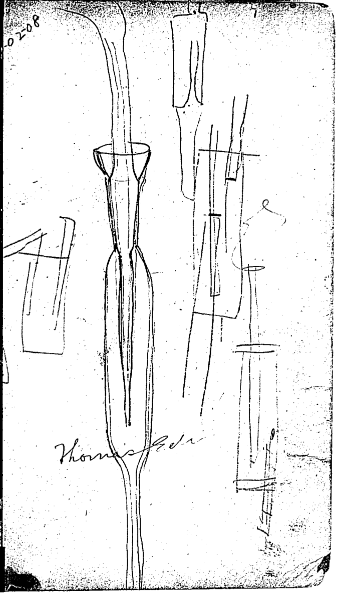

Thomas Edi